



Creating a firestorm: A review of children who deliberately light fires

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ARTICLE INFO

Article history:

Received 3 July 2010

Received in revised form 16 December 2010

Accepted 21 December 2010

Available online 12 January 2011

Keywords:

Arson

Juvenile firesetting

Juvenile delinquency

Child mental health

Youth offending

ABSTRACT

Deliberate firesetting is a significant social problem that causes millions of dollars of property damage each year. Of particular concern is that a high proportion of these arson offences are committed by children and adolescents. Youth firesetters are a unique and diverse group, variant in their motivations, needs and behavior and distinct from their adult counterparts.

The study of firesetting has been approached in a number of ways and thus the existing body of research lacks a coherent, consistent and comprehensive set of empirical findings. In synthesizing the literature on child and adolescent firesetting, this review considers the potential relationships between firesetting typologies, risk factors, development and treatment. It considers the extent to which firesetting can be considered within the framework of antisocial behavior and what implications such a relationship may have for clinical practice.

The review concludes that despite a number of risk factors being repeatedly identified, an understanding of the etiology behind firesetting behavior and potential developmental trajectories remain theoretically rather than empirically based. Existing typological theories do not take sufficient account of the complexities of firesetting behavior and there is not yet a typology and accompanying assessment that has undergone thorough empirical testing and is of significant clinical utility. Despite indications that the relationship between firesetting and antisocial behavior is of a serious nature, there has been a general lack of attention to this in literature and practice. Attention to this relationship is necessary not just in the area of firesetting research and practice but also amongst those working with youth with behavioral difficulties and conduct problems as for these individuals firesetting is likely to indicate particularly high risk for severity of behavior and future offending. Because of this relationship and the diversity of firesetting populations there is a need for collaborative intervention for firesetters that includes thorough assessment and provides an individualized, and developmentally appropriate approach best suited to the needs of the individual. This review reflects on the methodological limitations as well as clinical implications of existing studies and suggests necessary directions for future research.

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1. Introduction

The aim of this literature review is to consider existing research, theory and practice regarding child and adolescent firesetters. For the purposes of this review the term ‘firesetting’ encompasses all deliberate setting of fires and the term ‘firesetters’ refers to children and adolescents who engage in firesetting behavior. Such a broad definition has been adopted so as to best encompass the various firesetting populations which have been the subject of research efforts, as well as the diversity of those who are likely to be referred to fireservice intervention programs, mental health or justice agencies as a result of firesetting behavior.

Firesetting has been approached by researchers in a myriad of ways and consequently lacks a coherent, consistent and comprehensive set of empirical findings. This literature review aims to provide an overview of contemporary, and currently relevant research, and to consider the relationships between, as well as strengths and weaknesses of theorized and empirically validated firesetting typologies, risk factors, developmental theory, and intervention approaches. While acknowledging the methodological limitations of relevant studies, this review aims to consider the implications of the existing body of literature for both fireservice based programs and mental health practice with firesetters, and to suggest directions for future research in this field.

This review does not intend to be an exhaustive summary of all literature concerning firesetting behavior. Rather, with a focus on literature published within the past 20 years, it endeavors to consider the recurring themes and to select for discussion the most methodologically sound research and that which has the greatest implications for current practice with firesetters. The primary databases used to search for literature were *PsychInfo*, *Medline*, *Eric* and *ProQuest Dissertations and Theses*, and only literature published since 1990, unless of particular importance, was included in this review.

2. Prevalence and cost

Community sample studies indicate that firesetting occurs in around 5–10% of children and adolescents (Chen, Arria, & Anthony, 2003; Dadds & Fraser, 2006; Martin, Bergen, Richardson, Roegar, & Allison, 2004). However, far higher prevalence rates have been reported in two recent adolescent community sample studies, with just under a third of these populations reporting engagement in firesetting behavior in the past year

(Del Bove, Caprara, Pastorelli, & Paciello, 2008, MacKay, Paglia-Boak, Henderson, Marton, & Adlaf, 2009). Differences in firesetting prevalence rates found in community studies are likely to reflect variation in research methodologies and measures of ‘firesetting’.

Youth are shown to consistently account for a large percentage of arson offences in a range of national statistics and the costs and damage incurred are extensive. In the United States, children 10 years of age or under account for a greater percentage of arson arrests than for any other crime (Hall, 2007). In 2009 45% of arson arrestees in the United States were under the age of 18 (U.S. Department of Justice, 2010). Similarly, in the United Kingdom, 40% of arson offences in 2000 were perpetrated by young people between 10 and 17 years of age (Arson Prevention Bureau, 2003) and in New Zealand for the year 2007/8, those under 21 years of age accounted for 73% of all apprehensions for arson and under 17 for 55.6% (Statistics New Zealand, 2008).

However, of all offences committed by adolescents, arson rates remain low. In the United States in 2009 arson arrests under the age of 18 accounted for only 1.3% of property crime and only 0.3% of all arrests under the age of 18. Similarly, in New Zealand in 2007, while there were 38,563 apprehensions of under 17 year olds, only 471 (1.2%) of these were for arson (New Zealand Ministry of Justice, 2008).

While studies show extremely variant rates of recidivism dependent on sample population, presence of intervention, definition of recidivism and follow-up period, it is apparent that a significant number of firesetters engage in recidivistic behavior. Studies that address recidivism show rates of up to 59% (Kolko, Day, Bridge, & Kazdin, 2001; Kolko & Kazdin, 1992; MacKay et al., 2006). In a recent community sample of adolescents, just under 50% of those who reported firesetting reported 3 or more episodes in the past year (MacKay et al., 2009). Similarly, another recent community study found that at initial assessment 40% of firesetters reported recurrent firesetting at initial assessment and 15% reported engagement in recidivism during a 2–4 year follow-up period (Del Bove et al., 2008).

Such findings indicate that firesetting is not only a damaging and costly behavior, but that it is also often a persistent one and thus poses a serious problem for fire service and mental health practitioners.

3. Typologies

Child and adolescent firesetters are a very diverse group, exhibiting extensive variation in their backgrounds, firesetting

behaviors, motives and extent of comorbid psychopathology. Consequently, approaching firesetters as a singular group or firesetting as a single, consistent pattern of behavior, fails to address the complexity of the behavior and its causes. While it is currently unclear to what extent firesetters are able to be typologized, there is a general consensus amongst practitioners working with firesetters that there are a number of firesetting 'types' who present with distinct characteristics. Practitioners and researchers have attempted to define these subtypes as a means of enhancing understanding of firesetting individuals, the differences in the severity, pervasiveness and development of their behavior, and their consequent assessment and treatment needs. While firesetters have been theoretically typologized in a number of ways, the predominant approach is to categorize firesetters by motivation. More recently, this approach has been challenged by the first empirically derived typology (Del Bove, 2005) which identified three distinct firesetting clusters that differed on a range of individual, environmental and fire specific variables.

3.1. Child vs. adolescent

Many theorists have, at least for the purposes of research; distinguished between child and adolescent firesetters on the premise that firesetting in adolescence tends to be more severe and antisocially motivated than in childhood. However, it is notable that the relationship between age and rates of firesetting was also seen within a community sample of children, with fire interest and match and fire play increasing with age (Dadds & Fraser, 2006). Additionally, similar numbers of children and adolescents are present across different severity groups, and, within these groups, children and adolescents were equally likely to engage in recidivism, indicating that children may be equally at risk for severe firesetting behavior as their adolescent counterparts (Del Bove, 2005). The current body of literature lacks specific comparisons of the two age groups in terms of firesetting and therefore, at this stage, the extent to which they may or may not be considered distinct groups remains unclear. However, regardless of whether these age groups differ in their firesetting behavior, an acknowledgement of the different developmental stages and needs of children and adolescents is likely to be necessary for working effectively with behaviorally problematic youth and delivering age-appropriate treatment (Farmer, Compton, Burns, & Robertson, 2002; Ministry of Social Development, 2009).

3.2. Motivational typologies

Motivation is widely understood to be a crucial element in the understanding and treatment of firesetters and is the most prevalent means of categorizing firesetters in current practice (Kolko, 2002). The most well known motivational typologies are derived from those theorized by Wooden and Berkey (1984) and Fineman (1995). Fineman (1995) theorized that there are two broad types of firesetter – *Pathological* and *Non-pathological* – each with a number of subtypes. Fineman's (1995) subtypes are as follows (the former two being non-pathological subtypes and the latter five pathological): *Curiosity firesetter*, *Accidental firesetter*, *Cry-for-help firesetter*, *Delinquent firesetter*, *Severely Disturbed firesetter*, *Cognitively Impaired firesetter* and *Sociocultural firesetter*. The following four subtypes are those which most commonly inform practice in the area of firesetting (Kolko, 2002):

Curiosity firesetter: usually very young, firesetting is experimental, absence of wider psychopathology or family dysfunction.

Cry-for-help firesetter: often show early behavior problems, engage in firesetting behavior largely for attention, behavior results from environment dysfunction and stressors.

Delinquent firesetter: behavior is usually present in adolescence, exhibit greatest deviance and behavioral dysfunction.

Severely Disturbed: rare, firesetting is comorbid with a wide range of other pathologies, early signs of behavior resulting from individual pathology.

Though motivation is an important consideration in assessment of firesetters, motivational typologies are problematic in a number of ways. They are theoretical and therefore not based on empirical findings, and there does not currently exist a body of literature supporting motivational typologies.

Slavkin (2001b) investigated Fineman's (1995) theoretical typologies using a sample of firesetters (N=888) aged between 3 and 18 years, who had participated in the Marion County Arson Investigation Network (MCAIN) Fire Stop program. Exploratory analyses indicated that pathology, social skills and delinquency were the factors which best predicted the typology that was indicated on their MCAIN assessment form and between subjects analysis were subsequently performed to compare typologies on these factors. The typologies included in the analyses were three 'non-pathological types'—'curiosity', 'accidental' and 'cry-for-help' firesetters, and two 'pathological types'—'delinquent' and 'pathological' firesetters. Two other subtypes proposed by Fineman (1995), namely 'cognitively impaired' and 'socio-cultural' firesetters, were not included in analyses due to the low numbers of firesetters in the sample categorized as these types (n=12). Interestingly, while significant differences were found between the pathological and non-pathological subtypes on all three measures, no differences were found between subtypes within the pathological and non-pathological groups. That firesetting subtypes were not found to differ in their levels of pathology, delinquency or social skills suggests that motivational subtypes are unlikely to each represent a distinct path of behavioral development or etiology.

By isolating single motivations and attempting to group firesetters by these, motivational typologies fail to account for the fact that motivations are not necessarily mutually exclusive and that multiple motivations can play a role in an individual's firesetting behavior as is indicated by Kolko and Kazdin (1991a). A single firesetting incident may involve multiple motivations, and recidivist firesetters may be motivated differently for different fire incidents. Fineman (1995) acknowledges this possibility but doesn't suggest how best to categorize a firesetter who presents with motivations associated with more than one firesetting type.

The label 'curiosity' firesetter is misleading as it implies that curiosity is a distinguishing feature of non-severe firesetting behavior. As a result, it is widely assumed that curious firesetters are of less concern than other subtypes and need relatively little in the way of intervention. This is particularly concerning, as such assumptions have been increasingly contradicted by studies which show that curiosity, particularly fire curiosity, is actually associated with more severe, frequent and persistent firesetting behavior (Del Bove, 2005; MacKay et al., 2006; Kolko & Kazdin, 1991a). Firesetters whose fire involvement is motivated by curiosity have been found to have heightened levels of externalizing behavior, overt and covert behaviors and aggression, a more extensive history of fire interest and involvement, and to be at greater risk of recidivism than their low curiosity counterparts (Kolko & Kazdin, 1991a). While for more pathological type firesetters curiosity is likely to co-occur with other, possibly more salient motivations, curiosity, due to its association with severe behavior, should not be dismissed as a relatively benign motivation.

3.3. Del Bove's empirically derived typology

In response to the absence of empirically derived typologies for firesetters, Del Bove (2005) applied cluster analysis techniques to a sample of firesetters and derived three distinct clusters, or subtypes, which differ not only in the severity of their firesetting behavior but

also on a large range of other individual, environmental and fire specific variables.

3.3.1. *Conventional-limited (CL)*

This cluster represents individuals with the least severe firesetting behavior. In comparison with the other two clusters, they exhibit less fire involvement and are less versatile in their use of targets and ignition sources. Their behavior tends not to be antisocially motivated and they tend to express remorse for their behavior. They exhibit the oldest age of onset for firesetting behavior and the least fire interest or curiosity. This group has the highest level of socioeconomic status and is least characterized by family dysfunction, with the most parental contact and least abuse exposure (15%). This group exhibits the lowest levels of child psychopathology, with no social skills deficits, externalizing behavioral or attention problems of clinical significance. They exhibit oldest age at first mental health and child welfare contact, as well as the best school performance. While this group is at the least risk for future fire involvement and general behavior problems, it is notable that CL firesetters are not 'one-off' firesetters but rather have an average of 3–4 occasions of fire involvement (Del Bove, 2005).

3.3.2. *Home-instability-moderate (HM)*

The HM cluster represents the middle cluster in terms of firesetting severity, however members are characterized by the greatest family dysfunction. Firesetting behavior in this group is characterized by, in comparison with CL, more frequent fire involvement, a wider range of targets and ignition sources, a younger age of firesetting behavior onset and heightened fire interest. They are more likely to have an antisocial motivation for their behavior (38%) and express less remorse (33%) than the CL cluster. They exhibit increased social, attentional and externalizing behavioral problems than CL but less than MP. HM firesetters experience the greatest family dysfunction of the three clusters, with the least parental involvement, the highest rates of abuse (75%) and heightened maternal psychopathology. They tend to be within child welfare agency care rather than living with a parent, and their referral for firesetting tends to closely follow the experience of an immediate stressor.

3.3.3. *Multi-risk Persistent (MP)*

MP firesetters represent the most severe of the three clusters, with the greatest number of fire incidents, the most diverse use of targets and ignition sources, the youngest age of onset and the highest level of fire curiosity. Their level of remorse expressed and the extent to which their fire-related behavior is antisocially motivated is similar to that of those belonging to the HM cluster. This cluster experiences more family dysfunction than CL, with lower levels of parental involvement, increased rates of abuse and more contact with child welfare agencies. However, in comparison with the HM cluster, they have more parental involvement, less exposure to physical abuse and neglect, comparable levels of sexual abuse and are less likely to be in the care of a child welfare agency. Individuals present with clinically significant levels of social skill deficits, externalizing behaviors and attentional difficulties and tend to be academically below average. MP firesetters had significantly higher rates of recidivism at follow-up than the other two groups.

Del Bove's (2005) empirically derived typology, although in need of replication, provides the most comprehensive and multidimensional typology to date and a foundation which future research can both draw from and build on. However, the stability of and ability to generalize these firesetting types is at this stage unclear. This study utilized a population of youth referred to a firesetting intervention program, and the findings may differ if a community sample or alternative clinical sample was used. As the first empirical typology of a firesetting population, the cluster solution of this study must be

considered exploratory and in need of testing in various populations. Without further validation, this typology acts more as a framework for future investigation of, and thought surrounding firesetting populations. It does however strongly suggest the probability that a multifactor typology, which addresses a wide range of biopsychosocial factors, is necessary to best describe firesetting types.

3.4. *Summary of typologies*

Firesetting behavior is often the product of a number of precipitating risk factors that interact in a complex manner to produce and in some cases maintain firesetting behavior. While it is important not to assume that a complex and multi-faceted behavior such as firesetting can be clearly categorized into subtypes, clinical experience with firesetters indicates that there are certain types who have distinct behavioral, environmental and psychological characteristics. Additionally, exploratory analyses by Del Bove indicate that there are likely to exist clusters of firesetters defined by differences in a large range of factors. However, a typology should not act to encourage a simplistic view of firesetting but rather to better clarify which of the many correlates and characteristics of the behavior are likely to co-exist.

Typologies should improve clinical practice and outcomes for firesetting individuals by allowing for more efficient risk assessment, identification and understanding. A useful typology should both result from well-designed research and provide a framework for future research. Typologies that are not empirically derived are unlikely to be of benefit to clinicians, researchers, intervention programs or firesetters and are potentially detrimental as they assume relationships between exhibited human cognitions and behavior, along with environmental factors. Such assumptions could potentially lead to incorrect understandings of firesetters and less effective intervention approaches (particularly when used in community intervention program settings where the staffs are unlikely to have mental health training).

While approaching firesetters as a singular group fails to acknowledge the complexity of this population, categorizing an individual primarily by motivation, as is the dominant approach to firesetting, is similarly limiting. Motivational typologies appear to constitute an overly simplistic approach to a complex behavior as they effectively prioritize one motivational force while minimizing the importance of other motivations and contributing risk factors.

The argument that motivation does not provide the most effective means for grouping firesetters should not be construed as minimizing the importance of motivation in assessing and understanding firesetting behavior. Motivation is likely to give insight into contributing environmental and individual factors as well as the cognitive and affective processes involved in firesetting behavior, which are keys to effectively addressing and eliminating the behavior. However, researchers and practitioners in the area of firesetting need to approach motivation in a more detailed and comprehensive manner than motivational typology allows for. If effective sub groupings of firesetters are able to be identified, different motivations are likely to exist in all types, possibly at different levels and potentially as a result of different environmental or individual precipitating risk factors.

Slavkin (2001b) suggests that his finding that Fineman's (1995) 'pathological' and 'non-pathological' firesetting types did differ in terms of pathology, delinquency and social skills, while his motivational subtypes did not. This indicates that a more simplistic typological triad which includes 'non-pathological accidental', 'non-pathological cry-for-help' and 'pathological firesetters'. However, a categorical dichotomy whereby firesetters are identified as either pathological or non-pathological may also fail to sufficiently account for differences between firesetters. Based on Del Bove's (2005) findings it seems likely that there is more than one pathological

subtype and that the differences between subtypes are likely to be subtler.

The current lack of empirical investigation into firesetting typologies is concerning given there is a need for discourse surrounding firesetting typologies to shift from practitioner-based theory to ongoing and comprehensive empirically based ones. Those working in the area must acknowledge that research surrounding firesetting typology is still in its infancy, and that further research is needed before typologies can be used successfully in clinical work.

4. Factors associated with firesetting behavior

Tables 1 and 2 summarize the studies discussed in this section including details of (where applicable) country of origin, sample population, gender ratio, age range, groups, definitions and measures of firesetting and/or recidivism, follow-up period length, and significant findings including recidivism rates and factors associated with firesetting or firesetting recidivism.

4.1. Gender

Boys are consistently shown to be more likely to exhibit firesetting behavior, with a prevalence of around 2–3 times that of girls, across a range of community samples (Chen et al., 2003; Dadds & Fraser, 2006; Del Bove et al., 2008; Martin et al., 2004), which is consistent with gender differences seen in other externalizing antisocial behaviors and in conduct disorder (CD). As a result of the small number of female youth who engage in firesetting, research has largely neglected to address this group, or the possibility of differences between the genders. There is some evidence that different factors may be associated with firesetting behavior in boys than in girls (Dadds & Fraser, 2006; Martin et al., 2004), highlighting the probability that girls may have different needs in treatment. However, because similar proportions of females are seen across severity groups, it is also possible that they may not represent a distinct firesetting subtype (Del Bove, 2005; Martin et al., 2004).

4.2. Family dysfunction

Like many youth with behavioral and emotional disturbances, firesetters tend to come from families characterized by dysfunction, parent psychopathology and maladaptive parent–child relationships. Although this trend is relatively consistent throughout the literature, there is less consistency in terms of the relationship between specific family factors and firesetting, likely to be largely due to wide variations in study design, measures and variables investigated.

In comparison with those of non-firesetting children, families of firesetters tend to be characterized by higher parental stress (Dadds & Fraser, 2006), parent psychological dysfunction, less family and marital cohesion, and a generally poorer quality of parent cohabiting relationships (Kolko & Kazdin, 1990), as well as increased marital violence, paternal alcohol use and paternal abuse of animals (Becker, Stuewig, Herrera, & McCloskey, 2004). Parents of firesetters have been found to provide limited supervision (Sakheim & Osborn, 1999) and child report measures have shown parents of firesetters to be higher on instilling anxiety and non-reinforcement scales (Kolko & Kazdin, 1990) in comparison to parents of non-firesetters. Mothers of firesetters, in comparison to those of non-firesetters, have been found to be more lax in their discipline, monitor their children less, and to report less child acceptance and child-centeredness (Kolko & Kazdin, 1990). In comparison with non- or minor firesetters, severe firesetters were more likely to experience strong feelings of anger at maternal rejection, neglect or abandonment, and anger at paternal absence, rejection, abandonment or abuse (Sakheim & Osborn, 1999). Interestingly, Dadds and Fraser (2006) found that firesetting girls experienced both significantly more positive and negative parenting

than non-firesetting girls, but comment that such a finding is not easily explained. Given that their families tend to be characterized by dysfunction, it is not surprising that firesetters have been found to experience a significantly higher number of stressful life events than their non-firesetting counterparts (Kolko & Kazdin, 1990).

It is important to note that an Australian community sample which identified family dysfunction to be one of the variables most strongly associated with firesetting behavior found that it did not independently contribute to firesetting behavior after controlling for antisocial behavior (Martin et al., 2004). This indicates that while family dysfunction may constitute a risk factor for antisocial behavior in general, it is not necessarily a risk factor for firesetting behavior specifically.

The role of family factors in firesetting recidivism is less evident than the role of family factors in firesetting generally, and studies have provided little consistent evidence in this area (Kennedy, Vale, Khan, & McAnaney, 2006). While Kolko and Kazdin (1992) found that family conflict contributed significantly to the prediction of recidivistic behavior at 1 year follow-up, a later study (Kolko et al., 2001), found that parent and family measures at initial assessment did not contribute to the prediction of firesetting within a 2 year follow-up period in either patient or non-patient samples. Additionally, Kolko, Herschell, and Scharf (2006) found that variables concerning parent or family clinical functioning did not contribute to the prediction of firesetting recidivism within a 1 year follow-up period.

4.3. Abuse

As with child and adolescent psychopathology in general, there is evidence for a relationship between abuse and firesetting behavior (Martin et al., 2004; Root, MacKay, Henderson, Del Bove, & Warling, 2008). Martin et al. (2004) found that firesetting boys were significantly more likely to have experienced physical or sexual abuse than non-firesetting controls, and for boys, physical abuse was found to be a significant predictor of firesetting behavior. Within a firesetting sample, 48% of children were found to have experienced maltreatment, and firesetters who had a history of maltreatment were significantly more severe than those who had not experienced maltreatment on measures of firesetting frequency and versatility of ignition sources and targets (Root et al., 2008). Root et al. (2008) also found that maltreated youth involvement with fire was motivated by anger or an immediate family stressor to a significantly greater extent than that of their non-maltreated counterparts. Because the influence of maltreatment on fire-related variables was found to be partially mediated by externalizing behavior, Root et al. hypothesized that maltreatment results in behavioral and emotional regulation problems which act as mechanisms in the development of firesetting behavior. Becker et al. (2004) suggested that while there is limited evidence for the role of sexual abuse, specifically, this is likely to be due to the low number of girls in firesetting samples and the disproportionate number of girls to boys who have experienced sexual abuse.

4.4. Individual characteristics

A number of individual factors indicate the often serious clinical profiles of those individuals who present with firesetting behavior. Firesetting has been found to be significantly related to the number of depression, conduct disorder (CD), oppositional defiant disorder (ODD) and attentional deficit hyperactivity disorder (ADHD) symptoms of an individual (Becker et al., 2004), and in girls, firesetting appears to be associated with problems with anxiety and depression (Dadds & Fraser, 2006).

Social skill deficits such as poor social judgment, poor planning, weak social anticipation and feelings of loneliness, isolation and inadequacy in peer relations (Sakheim & Osborn, 1999), as well as

Table 1
Studies investigating factors associated with firesetting.

Study	Country	Sample characteristics	Sample details	Age group	Age range	Definition of firesetting behavior	Significant factors associated with firesetting
Becker et al. (2004)	USA	Community sample—families with histories of domestic violence. (Boys N = 184, Girls N = 179)	Total N = 363 • Firesetters (N = 32) • Non-Firesetters (N = 331)	Children and early adolescents	6–12 years	If either the mother or child reported a firesetting incident on the Child Assessment Schedule (CAS).	Firesetting was more prevalent amongst those whose family environment involved paternal figure abuse of pets, paternal figure alcohol use and marital violence. Significantly more firesetters than non-firesetters had a conduct disorder diagnosis. The number of CD, ODD, ADHD and depression symptoms were all significantly related to firesetting.
Chen et al. (2003)	USA	Community sample—National sample survey data. (Boys N = 2261, Girls N = 2230)	Total N = 4491 • Firesetters (N = 284) • Without self-reported firesetting history (N = 4207)	Adolescents	12–17 years	Reported having set a fire in the past 6 months on a version of the Youth Self-Report.	Peer rejection, aggression and shyness (only when combined with aggression). Strongest association with firesetting when moderate to high levels of all three are present.
Dadds and Fraser (2006)	Australia	Community sample. (Boys N = 706, Girls N = 653)	Total N = 1359	Children	4–9 years	Falls within top 5% of Fire History Screen (FHS) for age group (4–6 years or 7–9 years) and gender.	Firesetters had significantly higher scores than non-firesetters on measures of: Boys—age, parental stress, antisocial behavior, hyperactivity, cruelty to animals, thrill-seeking temperament. Girls—parental stress, positive and negative parenting, antisocial behavior, problems with anxiety and depression.
Del Bove et al. (2008)	Italy	Community sample. (Boys N = 311, Girls N = 256)	Total N = 567 • Control (N = 250) • Aggressive non-firesetters (AGG) (N = 130) • Firesetters (FS) (N = 92) • Aggressive firesetters (AGG/FS) (N = 95)	Adolescents	11–18 years	Response to Youth Self-Report item 'I have set fires'.	<i>Aggressive non-firesetters (AGG) vs. aggressive firesetters (AGG/FS)</i> : Significantly more anxiety and depressive symptoms, thought problems, and attentional difficulties, significantly more likely to report using substances as a coping strategy, perceived by their parents to be significantly more likely to engage in delinquent behaviors and demonstrate sexual problems. Demonstrate significantly less academic and regulatory self-efficacy.
Forehand et al. (1991)	USA	Conduct disordered males (all incarcerated in state facilities).	Total N = 363 • Firesetter (firesetter with CD (4–6 symptoms)) • Non firesetter with CD (4–6 symptoms) • Non firesetter with fewer CD symptoms than 1 and 2 (3 symptoms)	Adolescents	13–17 years	During a standardized interview, youth reported having set fires.	Firesetting group and high CD group differed from the low CD group on a range of CBCL measures (withdrawal, delinquency and aggression) but did not differ from each other.
Kolko and Kazdin (1990)	USA	Non-patient (public school), Outpatient (from a psychiatric clinic) and Inpatient (psychiatric unit) populations. (Boys N = 313, Girls N = 164)	Total N = 477 • Firesetter (N = 198) • Matchplayer (N = 40) • No-fire (N = 239)	Children and early adolescents	6–13 years	If either parent or child reported firesetting in the past year.	Firesetters vs. non-firesetters: Lower parental acceptance, child-centeredness, monitoring, and discipline, lower family cohesion and achievement motivation, higher number of total life events in the current year, mother's parenting (more lax discipline, instilling anxiety and non-enforcement).
Kolko and Kazdin (1991a)	USA	Parent report firesetters. (Boys N = 112, Girls N = 21)	Total N = 133 • High on both anger and curiosity (N = 24) • Low on both anger and curiosity (N = 49) • High curiosity, low anger (N = 28) • High anger, low curiosity (N = 32)	Children and early adolescents	6–13 years	Either parent or child report of firesetting as assessed by the Firesetting History Screen (FHS).	<i>High vs. low curiosity motivated groups</i> : Significantly higher proportions engaged in matchplay, had a current interest in fire, and engaged in firesetting recidivism. <i>High vs. low curiosity motivated groups</i> : High curiosity groups higher on externalizing behavior, total problem behavior score, overt and covert antisocial behaviors and aggression, more likely to set fires out of the house, set less costly fires. <i>High vs. low anger motivated groups</i> : High anger group significantly more exposure to peer/family models aggression/defiance and rule violations factors.

Kolko and Kazdin (1991b)	USA	Sample recruited from Non-patient (public schools, no clinical service in past year) (N = 186), Outpatients (N = 104) and Psychiatric unit Inpatient samples (N = 17). (Boys N = 211, Girls N = 96)	Total N = 307 • Firesetters (N = 133) • Matchplayers (N = 34) • No-fire (N = 140)	Children and early adolescents	6–13 years	Either parent or child report of firesetting during the present year as assessed by the firesetting History Screen (FHS).	<i>Firesetters/Matchplayers vs. Non-firesetters</i> : Significantly higher (parent report) fighting/arguing, aggression and hostility, emotionality, internalizing, impulsivity, and significantly lower sociability, social competence and school performance. <i>Firesetters vs. Non-firesetters</i> : Significantly higher scores (parent report) on—measures of self-injury and substance use/interest, lying and carelessness, and (child report) internalizing, total problem behavior, externalizing behavior, aggressiveness, impulsivity, inappropriate behavior and lower assertiveness. <i>Firesetters vs. Matchplayers vs. Non-firesetters</i> : Significantly higher externalizing behavior scores, total problem behavior, covert behavior, property infraction, self advancement and secretiveness.
McCardle et al. (2004)	New Zealand	Sample recruited from agencies working with firesetters and those with behavioral or mental health problems as well as from a secondary school. Boys only.	Total N = 117 • Firesetters (N = 50) • Problem behavior (non-firesetters) (N = 33) • Control (N = 34) (no firesetting or behavior problems)	Adolescents	12–18 years	–	<i>Firesetters vs. Problem behavior non-firesetters</i> : Higher on measures of deviation, poor school performance and attentional problems. Significantly more had an ADHD diagnosis. History of frequent matchplay and early onset of matchplay behavior were key predictive factors in classifying firesetters as opposed to problem behavior youth. <i>Repetitive vs. single incident firesetters</i> : Greater levels of depression, interpersonal problems, alienation and deviation.
MacKay et al. (2006)	Canada	Firesetters referred to the TAPP-C. Boys only.	Total N = 192	Both	6–17 years	At least 1 episode of firesetting in the previous year that prompted referral to the TAPP-C.	Degree of antisocial behavior problems and degree of fire interest (correlated with frequency, versatility and age at onset of fire involvement, and firesetting recidivism). Fire interest contributes to the frequency, versatility and recidivism in firesetting but not to age of onset (above and beyond antisociality). Fire interest also added predictive value for future fire involvement (recidivism) above and beyond both antisocial behavior and past firesetting behavior.
MacKay et al. (2009)	Canada	Community sample	Total N = 3965 • Non-firesetters • Desisters (lifetime but no past year firesetting) • Low frequency (1–2 episodes in past year) • High frequency (3+ episodes in past year)	Adolescents	11–19 years	Response of '1' or more to the self-report item 'In the last 12 months how many times have you set something on fire that you weren't supposed to?'	<i>Desisters vs. non-firesetters</i> : male gender, age (older), psychological distress, binge drinking, frequent cannabis use. <i>Low and high frequency firesetters vs. non-firesetters</i> : Male gender, age (older), low parental monitoring, binge drinking, frequent cannabis use, delinquent behavior, sensation seeking, elevated psychological distress including suicidal intent. High frequency firesetters also has significantly more illicit drug use than non-firesetters. Mean number of risk factors was found to increase according to firesetting severity.

(continued on next page)

Table 1 (continued)

Study	Country	Sample characteristics	Sample details	Age group	Age range	Definition of firesetting behavior	Significant factors associated with firesetting
Martin et al. (2004)	Australia	Community sample. (Boys N = 1442, Girls N = 1154).	Total N = 2596	Adolescents	Grade 8 students	Single item drawn from DSM-IV criteria for CD—'I have set fire to things in public places just for fun'.	Factors found to be significantly more prevalent in both firesetting boys and girls than in non-firesetting controls: Extreme antisocial behavior (ASB), serious drug use, risk taking, suicidal thoughts and suicidal plans, family dysfunction, lack of mother care, lack of father care, depressive symptomatology and hopelessness. <i>Prediction of firesetting:</i> Boys—serious ASB is the strongest predictor of firesetting; serious drug use, physical abuse and risk taking make smaller but significant contributions. Girls—risk taking, serious drug use and serious ASB make similar contributions to the prediction of firesetting. <i>After controlling for ASB:</i> Boys—extreme ASB, serious and extreme drug use, suicide plans and attempts, experience of sexual abuse. Girls—extreme ASB, perception of academic failure, hopelessness.
Root et al. (2008)	Canada	Firesetters referred to the TAPP-C between 1996 and 2002. (Boys, N = 178; Girls, N = 27)	Total N = 205	Both	4–17 years	Had at least one episode of fire involvement in the past year prompting referral to the TAPP-C.	<i>Maltreated firesetters vs. non-maltreated firesetters:</i> exhibited greater frequency and versatility of firesetting, were more likely to set out of anger or following acute family stressors, and were more likely to be involved in firesetting at 18 month follow-up. Results indicated maltreatment was partially operating through externalizing, and to a lesser extent internalizing, to impact in firesetting versatility and frequency.
Sakheim and Osborn (1999)	USA	Firesetters and non-firesetters in residential treatment.	Total N = 180 • Severe/high-risk firesetters (N = 75) • Minor/non-severe firesetters (N = 50) • Non-firesetters (N = 55)	Both	5–33 years	–	Predictors of severe firesetting: excitement at fires, revenge fantasies, history of playing with fires, cruelty to animals or people, poor social judgment, rage at insults, inadequate superego development, IQ score, severe maternal rejection, sexual conflicts, obsessive, compulsive features, lack of empathy, history of physical aggression and anger at paternal figure. <i>Variables that present more frequently amongst severe firesetters vs. minor and non-firesetters:</i> Sexual excitement/pleasurable arousal associated with fires, Impulsive/ loses inhibitions, anger at maternal rejection/neglect/abandonment, anger at paternal absence/rejection/abandonment/abuse, cruelty to children/animals, poor social judgement, inadequate superego development, poor peer relations, engagement in power struggles with adults (is rebellious, oppositional, defiant), revenge fantasies, fire preoccupation, attraction or fantasy, lacks of empathy, limited parental supervision, exposure to fire before age 8, less guilt, shame or remorse regarding firesetting, poor planning and weak social anticipation, rage at insults or humiliations, past history of physical violence, diagnosis of CD.
Stickle and Blechman (2002)	USA	Juvenile offenders. (Boys N = 157, Girls N = 62)	Total N = 219 • Firesetting juvenile offenders (N = 85) • Non firesetting juvenile offenders (N = 134)	Adolescents	11–18 years	–	A three-factor model of antisocial behavior with dimensions of aggressive, non-aggressive and oppositional antisocial behavior best fit both firesetting juvenile offenders and non-firesetting juvenile offenders.

Table 2
Recidivism studies.

Study	Country	Sample characteristics	Sample age range	Follow-up	Measure of recidivism	Recidivism rates	Factors associated with, or predictive of recidivism
Kennedy et al. (2006)	UK	n/a. A systematic review of the literature (8 studies which met selection criteria).	–	–	–	–	Previous firesetting behavior and covert antisocial behavior were the only two factors that consistently predicted firesetting in those studies which assessed them.
Kolko et al. (2001)	USA	N = 268 Firesetters and non-firesetters from outpatient clinic patients (N = 162) and non-patient (public school) (N = 106) samples.	6–13 years	2 year follow-up Note: 9.5% of non-patients (n = 13) and 67% of patients (n = 62) received treatment during the follow-up period.	Presence of firesetting in follow-up period (between study intake and 2-year follow-up) acknowledged by either the child or parent in responses to the Firesetting History Screen (FHS).	50% (non-patient sample) and 59% (patient sample) of initial firesetters became recidivists.	<i>Variables predictive of any firesetting at follow-up</i> (for the whole sample i.e. firesetters and non-firesetters)—Non-patients: Male gender, African-American ethnicity, involvement in firesetting and covert antisocial behavior at intake. Patients: Involvement in matchplay, fire-related acts and covert antisocial behavior at initial assessment.
Kolko et al. (2006)	USA	N = 46 Boys referred to the study for firesetting behavior.	5–13 years	12-month follow-up	Presence of firesetting (reported by either the child or the parent) at follow-up.	–	<i>Variables found to predict firesetting recidivism independent of treatment condition</i> : Number of matchplay and fireplay incidents, curiosity about fire, scores on the Fire Attraction and Interest Scale (FAIS), involvement in fire-related acts, level of externalizing behavior problems.
Kolko and Kazdin (1992)	USA	N = 138 All firesetters. Patient (outpatient clinic) (N = 100) and non-patient (community) samples (N = 38).	6–13 years	1-year follow-up	Identified as a firesetter at initial assessment and as having set an additional fire by follow-up.	35% (of those initially identified as firesetters), 18% (of those initially classified non-firesetters).	<i>Recidivists vs. non-recidivists</i> : significantly greater hostility and carelessness, family conflict, knowledge about things that burn, involvement in fire-related activities, less family organization and maternal acceptance, more lax discipline and exposure to stressful life events within the past year. Using the adjusted level, significant differences remained on only the hostility and lax discipline variables. <i>Significant predictors of recidivism (at 1 year follow-up)</i> : Carelessness, family conflict, knowledge and child hostility.
Kolko and Kazdin (1994)	USA	N = 95 Firesetters who acknowledge having burned property or set a fire in the past year. Prior to intervention. From non-patient public school (N = 42), outpatient clinic (N = 30) or inpatient unit (N = 23) samples.	6–13 years	2-year follow-up	Parent and Child Report at follow-up (FSH score).	–	<i>Predictors of recidivistic firesetting during follow-up period</i> : Having originally caused minor damages, indicating that a consequence would stop them from setting a fire, having had a plan to set the fire and a neutral or positive feeling about the incident at initial assessment. <i>Characteristics predictive of the overall severity of firesetting at follow-up</i> : site of fire out of home, acknowledgement of being likely to set another fire, a neutral or positive reaction to the fire, no parental response to the fire, site of fire in the house, minor severity of damages, seeking out incendiary materials.
MacKay et al. (2006)	Canada	N = 192 Firesetters referred to the TAPP-C with at least 1 episode of firesetting in the previous year.	6–17 years	18-month follow-up	Involvement in an additional firesetting episode during the follow-up period.	26%	Fire interest contributed to firesetting recidivism (even after controlling for antisociality).
Slavkin (2001a)	USA	N = 888 Referred to MCAIN for firesetting.	3–18 years	None	Presence of recidivistic firesetting behaviors as identified using information taken from the Juvenile Fire Risk Interview Form (Fineman, 1997).	–	Cruelty to animals.

peer rejection (Chen et al., 2003) were all found to be significantly higher for firesetters than non-firesetters. Repetitive firesetters were found to score significantly higher on measures of depression, interpersonal problems, alienation and deviation than single incident firesetters (McCardle, Lambie, & Barker-Collo, 2004). Severe firesetters have been found to be significantly more likely to lack empathy with others and significantly less likely to express remorse for the consequences of their firesetting behaviors than are their non-severe counterparts (Sakheim & Osborn, 1999). This finding is supported by Del Bove's (2005) severe firesetting subtypes (HM and MP), which show significantly higher rates of low levels of remorse than the less severe CL firesetters.

An apparent relationship between firesetting and impulsivity (Kolko & Kazdin, 1991b; Sakheim & Osborn, 1999), emotionality (Kolko & Kazdin, 1991b), risk taking (Martin et al., 2004), cruelty to animals (Dadds & Fraser, 2006; Slavkin, 2001a), thrill-seeking temperament and hyperactivity (Dadds & Fraser, 2006) indicates the significance and relevance of personality and trait-like factors, particularly those pertaining to impulse control. Additionally, high levels of risk taking as well as serious, harmful or illegal drug use were found to significantly contribute to the prediction of firesetting in both boys and girls (Martin et al., 2004).

Sexual dysfunction, although historically and theoretically linked to firesetting, is largely absent from recent literature. Sakheim and Osborn (1999) did, however, find sexual conflicts or dysfunction as well as pleasurable arousal or sexual excitement while watching or setting fires added significantly to the prediction of firesetting status. Based on the finding that both her severe subtypes (HM and MP) had similar levels of sexual abuse, behavior and concerns, Del Bove (2005) postulated that sexual behavioral concerns may be a by-product of arousal regulation or impulse control difficulties and are more characteristic of firesetters with emotional and behavioral psychopathology than of firesetting specifically.

4.5. Anger, hostility and aggression

In comparison to non-firesetters, both firesetters and match-players have been found to display more aggression (both direct and indirect) and hostility, and to engage more in fighting and arguing (Kolko & Kazdin, 1991b). Sakheim and Osborn (1999) found that a past history of physical violence, cruelty to children or animals, power struggles with adults including rebellious, oppositional and defiant behavior were all significantly more characteristic of severe firesetters or matchplayers than non-firesetters. As well as the aforementioned overt antisocial behaviors, firesetters have also been shown to display more covert antisocial behaviors when compared with non-firesetters, including lying and deceitfulness (Kolko & Kazdin, 1991b).

In addition to this, firesetters whose behavior was motivated by high levels of anger were found to engage in more fire-related activities, elicit greater community complaints about their fire contact, and had greater exposure to models of fire interest than their 'low anger' firesetting counterparts. They also exhibited high levels of deviant behavior prior to a firesetting incident and, in comparison with their low anger counterparts, received milder punishments and greater peer rejection and family attention subsequent to their firesetting (Kolko & Kazdin, 1991a).

4.6. Firesetting history

In a systematic review relevant literature, a history of firesetting was consistently found to predict recidivistic firesetting (Kennedy et al., 2006). Kolko et al. (2006) found that fire history variables (frequency of firesetting, matchplay and involvement in fire-related acts) predicted of recidivistic firesetting across three different treatment conditions within a 12 month follow-up period. Additionally, in a community sample study, Del Bove et al. (2008) found that

adolescents who were identified as firesetters at initial assessment, were significantly more likely to report firesetting at follow-up. Although these findings highlight firesetting history as a crucial assessment factor in determining recidivistic risk, Kennedy et al. (2006) note that they do not assist with an understanding of reasons for the emergence of firesetting behavior.

4.7. Fire interest

Curiosity about, attraction to, and interest in fire have all been found to predict recidivistic firesetting within a 12 month follow-up period, independent of treatment condition (Kolko et al., 2006). Fire interest has also been found to predict severity of recidivistic firesetting over and above that predicted by firesetting history (MacKay et al., 2006). Kennedy et al.'s (2006) review of the literature found that, of all the studies that assessed fire interest as a predictor of recidivism, only one (Kolko et al., 2001) found no significant effect. It is notable that parent reports of fire attraction and interest were significantly greater for firesetters who engaged in recidivistic firesetting (within a one-year follow-up period) than for non-recidivists (Kolko & Kazdin, 1992). However, because these fire specific factors were assessed at follow-up rather than at initial assessment, this study provides evidence only that they are statistically more likely to be characteristic of recidivist than non-firesetters, rather than evidence of their value as predictors of recidivism.

Fire interest has been found to account for variance in the severity of firesetting over and above that which was accounted for by antisocial behavior (MacKay et al., 2006). This indicates that fire interest, in particular, could be of significant utility in assessing risk for firesetting specifically, as opposed to antisocial behavior in general. MacKay et al. (2006) acknowledge, however, that further research is necessary to investigate the origin of fire interest in firesetting children and adolescents. Association between fire interest and severity is reflected in Del Bove's (2005) firesetting clusters. Del Bove's (2005) CL cluster has the lowest severity of behavior and also has the lowest level of fire interest, while the most behaviorally severe cluster, MP, exhibits the highest level of fire interest, and the HM cluster sits between the other two clusters on both these factors.

Firesetters whose firesetting behavior was motivated by high levels of curiosity have been found (when compared with low curiosity firesetters) to be more likely to be involved in multiple incident firesetting and to exhibit significantly higher rates of externalizing behaviors including heightened covert and overt antisocial behavior, aggression and increased interest in and contact with fire (Kolko & Kazdin, 1991a). Repeat firesetters were rated as significantly higher by parents on measures of curiosity than were single incident firesetters (Kolko & Kazdin, 1994). Research which shows that firesetters who exhibit high levels of curiosity also exhibit increased fire interest (Kolko & Kazdin, 1991a) and that fire interest predicts severity of firesetting (MacKay et al., 2006) poses problems for the theoretically non-severe, non-pathological 'curious' subtype (Fineman, 1995).

4.8. Fire incident variables

There is a lack of consistent evidence for the role of specific fire incident variables in predicting recidivistic behavior. Kolko and Kazdin (1994) found that fire involvement within a two-year follow-up in a sample of firesetting children, was predicted by acknowledgement at initial assessment, of being likely to set another fire, a neutral or positive reaction to the most serious fire incident that occurred within 12 months prior to initial assessment, as well as no parental response and an out-of-home location for this fire incident. Those who were recidivists at follow-up were 4.7 times more likely to have reported neutral or positive feelings in relation to a fire incident

at assessment (Kolko & Kazdin, 1994). However, Del Bove (2005) suggests that, given no differences in fire specific variables were significant across her empirically derived subtypes, the referral episode specifically may be less important in assessment than fire history and individual and environmental characteristics. It is possible, however, that regardless of cluster type, and the presence of specific fire incident variables might place any firesetting individual at increased risk for recidivism.

4.9. The antisocial nature of firesetting behavior

Research consistently links antisocial behavior to firesetting. An Australian study using a community sample of grade 8 students to assess the relationship between firesetting and a large range of family and individual factors, found serious antisocial behavior to be the best predictor of self-reported firesetting (Martin et al., 2004). In comparison with non-firesetters, firesetters exhibit more antisocial behavior (Dadds & Fraser, 2006), and are more likely to be classified as 'extreme' in their antisocial behavior (Martin et al., 2004). They also exhibit increased internalizing and externalizing behavior, covert antisocial behavior, inappropriate and problem behavior and more aggressiveness, hostility and substance use (Kolko & Kazdin, 1991b; Martin et al., 2004). Sakheim and Osborn (1999) found that a past history of physical violence, cruelty to children or animals, power struggles with adults, and rebellious, oppositional and defiant behavior were all factors significantly more likely to be present for firesetters than non-firesetters, and were also more characteristic of severe than non-severe firesetters. Within a sample of child and adolescent firesetters referred to a firesetting assessment and intervention program, 48% of subjects were in the clinical range of externalizing behavior, placing them in the most extreme 2% for their age group (MacKay et al., 2006).

While for some, probably 'non-severe' individuals, firesetting may occur as an isolated behavior unaccompanied by other antisocial behaviors, many firesetters are generalist in their behavior and firesetting is just one of a number of antisocial behaviors that they engage in. This is reflected as any of the complexities and associated adversities that apply to other problem behaviors are also applicable to firesetting. The association between firesetting and antisocial behavior is unsurprising given that firesetting is an antisocial behavior in itself and is one of 15 criteria of which three are needed for a diagnosis of conduct disorder (CD) (American Psychiatric Association [DSM-IV-TR], 2000). However, not all firesetters meet the criteria for conduct disorder and nor do all conduct-disordered children exhibit firesetting behavior, and consequently the close relationship between firesetting and antisocial behavior has been deemed to warrant further investigation. Kolko and Kazdin (1991b) found no interaction effect between firesetting status and conduct disorder, indicating the presence of a conduct disorder diagnosis was not sufficient to explain differences between firesetters and non-firesetters. Consequently, questions have been raised as to whether firesetting is a unique syndrome or whether it must be understood within the context of antisocial behavior. Research tends to indicate the latter is a more accurate approach.

Amongst those with serious antisocial behavior, firesetters differed from non-firesetters in that they reported more *extreme* antisocial behavior (Martin et al., 2004). Becker et al. (2004) found that firesetting predicts both violent and non-violent later delinquency, based on both official and self-reports and that child firesetters were three times more likely to be referred to juvenile court in adolescence, even after controlling for CD, indicating the seriousness of the increased risk for, and extreme nature of, antisocial behavior exhibited by firesetters. However, research has yet to elucidate the reasons why firesetting is associated with more extremely antisocial individuals

When delinquent firesetters were compared to non-firesetting delinquents with the same number of conduct symptoms, no significant difference was found between the two groups on measures of antisocial behavior, withdrawal, delinquency or aggression, although both these groups differed from non-firesetters with fewer CD symptoms (Forehand, Wierson, Frame, Kemptom, & Armistead, 1991). As groups differed on the severity of conduct disorder symptoms rather than firesetting status it may be deduced that severity of antisocial behavior better defines antisocial firesetters than their firesetting status itself (Forehand et al., 1991).

Despite its association with severe antisocial behavior, Forehand et al. (1991) acknowledge that it is still possible that firesetting differs from other antisocial behaviors in its etiology and development. Stickle and Blechman (2002) investigated whether the structure and pattern of antisocial behavior differed between firesetters and other antisocial individuals. Although firesetters, as expected, exhibited significantly more total antisocial acts as well as higher aggression than non-firesetting offenders in the sample, a three-factor model of antisocial behavior proved to best fit *both* groups, indicating that while the severity of their behavior differed, its underlying structure did not.

While a relationship between firesetting behavior and more extremely antisocial individuals has important implications for practitioners working with both firesetting and behaviorally problematic youth, there remains an alarming lack of attention to this issue in current research and practice concerning firesetters. This relationship suggests that antisocial firesetters are likely to be generalist and particularly severe in their problem behavior and that referral to fire-related services should therefore be accompanied by referral to services that can address other problem behaviors and the individual and environmental factors which produce and maintain these behaviors.

It is important to note that the conception of firesetting as an advanced antisocial behavior, while empirically supported, is limited to those firesetting individuals who are comorbidly conduct-disordered, or otherwise antisocial, and is therefore not applicable to more 'conventional', less antisocial firesetters.

4.10. Developmental factors impacting upon the risk of firesetting

Research has primarily investigated the role of risk factors associated with firesetters with heightened environmental, behavioral and psychopathological problems. Consequently the literature has largely overlooked those who are less pathological, less antisocial individuals with more family stability, more parent involvement and lower levels of behavioral and emotional disturbance. While these individuals are less likely to exhibit comorbid oppositional behaviors or conduct problems, they still may have some level of psychopathology such as attentional or learning difficulties (Del Bove, 2005). It is likely that boredom, lack of parental supervision, low fear of fire, lack of fire safety knowledge and access to matches, lighters or other ignition sources may contribute to a firesetting episode for these children. However, additional research is necessary to further elucidate the etiology and possible development of their firesetting behavior.

While many firesetting risk factors have been identified, the etiology of pathological firesetting, which is maladaptive and usually accompanied by other pathology and maladaptive behaviors, remains largely theoretical. While some studies have attempted to understand the interactions of selective factors in the development and persistence of firesetting (Chen et al., 2003), none have successfully revealed mechanisms involved in a behavior that appears to result from a complex and cumulative interaction of multiple variables.

Fineman (1995) presents a dynamic-behavioral model, which postulates that pathological firesetting behavior is the result of 'an interaction between dynamic historical factors that predispose the

firesetter toward a variety of maladaptive and antisocial acts, historical environmental factors that have taught and reinforced firesetting as acceptable, and immediate environmental contingencies that encourage firesetting behavior'. These immediate environmental contingencies include crisis or trauma, cognitive distortions and feelings prior, during and after the fire, and both external and internal reinforcing factors.

The State Fire Marshal in Oregon developed a model to explain how firesetting in children develops and is maintained ([Oregon Treatment Strategies Task Force, 1996](#)). The Oregon Model proposes that youth firesetting is cyclic in nature and involves four different cycles that each contribute to the onset and maintenance of firesetting behavior. The four cycles are: the Community Cycle (factors in the community that impact upon the young person and their family), the Family Cycle (family characteristics and dynamics), the Behavioral Cycle (behaviors that contribute to and maintain both firesetting and other at risk behaviors) and the Cognitive-Emotional Cycle (including the firesetter's motives and beliefs about their firesetting). The model proposes that each of the four cycles should be targeted during assessment and intervention. Like many models and typologies that have been developed in the field for children and youth who deliberately light fires, it remains to be empirically tested or validated. However, this model is of clinical utility in that it provides a comprehensive assessment and treatment framework for those working with young people and their families.

When considering the causes of child firesetting, it is important to consider a behavioral perspective within a developmental model. A key contemporary theory on the causation of crime is that of social learning theory, whose premise is that antisocial behavior is learnt ([Akers, 1990](#); [Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979](#); [Burgess & Akers, 1966](#); [Pratt et al., 2009](#)). Social learning theory was originally developed by [Burgess and Akers \(1966\)](#) who argued that antisocial behavior was learnt via the principles of behaviorism and operant conditioning ([Jensen & Rojek, 2009](#)), through a process of differential reinforcement and modeling. [Akers et al. \(1979\)](#) proposed that operant conditioning was the primary mechanism in social learning theory and whether deviant behavior continues is dependent on if the behavior is rewarded or punished. When describing differential reinforcement, Akers states: "whether deviant or conforming behavior is acquired and persists depends on past and present rewards or punishments for the behavior and the rewards and punishment attached to alternative behavior" ([Akers et al., 1979, p. 638](#)).

In a recent meta-analysis based on 133 studies, it was concluded that "the empirical support for social learning theory stacks up well" ([Pratt et al., 2009, p. 23](#)). Further support for social learning theory comes from research into the predictors of crime and recidivism. Several meta-analyses have found variables associated with social learning theory (antisocial peer associations and antisocial attitudes) to be amongst the strongest predictors of antisocial behavior ([Pratt et al., 2009](#)). While the relationship between firesetting and social learning theory has not been empirically studied, the clinical work of ours in New Zealand and our international colleagues in the field suggests that social learning and operant conditioning principles have a significant role in the etiology and maintenance of deliberate firesetting behavior in children.

In more antisocial, severe, or pathological firesetting subtypes, it is likely that environmental dysfunction (family dysfunction, conflict, abuse and psychopathology), coupled with lack of secure attachment to parents and individual difficulties, may result in a child or adolescent with an underdeveloped ability to regulate emotion and maladaptive strategies of coping with the multiple life stresses they experience. Firesetting and other problematic behaviors may therefore emerge as a means of coping, gaining significance or a sense of control, relating to peers and expressing emotions, including anger. This may be reflected in the finding that the use of alcohol and drugs as a coping strategy was significantly more prevalent in both aggressive and non-aggressive firesetters than aggressive non-firesetters and controls ([Del Bove et al., 2008](#)).

Additionally, environmental and internal reinforcing factors, which are more likely to be present in dysfunctional and pathological environments, may contribute to the learning of antisocial behavior through a lack of appropriate behavioral controls to inhibit such behaviors. There is a vast body of scientific evidence indicating that impulsivity or being unable to emotionally self-regulate ones emotions is an important factor in children who display delinquent and antisocial behavior ([Farrington et al., 1990](#)). Impulsiveness has consistently been found to be a reliable indicator of delinquent behavior ([Romero, Luengo, & Sobral, 2001](#)). A lack of inhibitory controls in some young people is likely to be a contributing factor to deliberate firesetting.

It is likely that dysfunctional family factors (such as a lack of appropriate parental discipline, abuse and parental psychopathology) act to maintain or reinforce its firesetting behaviors. Additional factors which may reinforce firesetting behavior include its role in expressing emotions, gaining attention or providing peer group interactions ([Wilcox & Kolko, 2002](#)), or the sensory effects of fire itself ([Fineman, 1995](#)). For children particularly, the very nature of fire – its color, dynamic nature, heat and noise as well as its potential power, and the drama surrounding firesetting incidents – are often very enticing and enthralling and may act to reinforce firesetting behavior.

Because firesetting is best understood within the framework of antisocial behavior, it is possible that its epidemiology may also be; a notion supported by the firesetting risk factors which appear in the literature. However, there is limited understanding as to the mechanisms involved in the emergence of firesetting specifically, within the context of antisocial behavior. What is it that makes an individual set a fire instead of, for example, bullying or stealing? And why might one conduct-disordered child set multiple fires throughout their youth while another never does? While it is possible that the answers to these questions lie in a more comprehensive understanding of the epidemiology of antisocial behavior and the role of firesetting within this, current understanding is limited to a small number of investigations of risk factors specific to firesetting.

Because firesetting has been found to be associated with, share a number of risk factors with and to be structurally similar to severe antisocial behavior, it is necessary to determine which factors increase risk for firesetting specifically. [Fineman \(1995\)](#) distinguishes risk factors that place an individual at risk for maladaptive behaviors generally, and those which pose risk for firesetting specifically suggesting that 'lack of early parental supervision relative to fire interest or fire play, a lack of previous training in fire safety, a history of previous firesetting and the appropriateness of a parent or significant other's response to a fire may all place an individual at risk for maladaptive fire use. However, [Fineman's \(1995\)](#) comments are theoretically based and currently lack empirical support. Although research has largely ignored this issue, fire interest, as a predictor of both firesetting status and firesetting recidivism *after* controlling for antisocial behavior, has potential as an important risk factor for firesetting *within* antisocial youth ([MacKay et al., 2006](#)). There is, however, a lack of understanding concerning the development of heightened fire interest in youth and adolescents. [Martin et al. \(2004\)](#) found that while there are many differences between firesetters and non-firesetters in general, fewer differences are apparent when comparing severely antisocial members of both groups. After accounting for antisocial behavior, for boys, firesetting was associated with *extreme* antisocial behavior, serious and extreme drug use, suicide plans and attempts and experience of sexual abuse, whereas for girls firesetting was associated with extreme antisocial behavior, perception of academic failure and feelings of hopelessness ([Martin et al., 2004](#)). Additional studies, which similarly look at risk factors for firesetting after controlling for antisocial behavior, and the emergence of firesetting within antisocial samples, are necessary in order to enhance understanding of which factors place antisocial individuals at risk for firesetting specifically.

Within a sample of offenders, firesetting is associated with early onset and severity of antisocial behavior (Stickle & Blechman, 2002). However, it must be noted that severe antisocial behavior is not limited to early onset. Conduct disorder has two subtypes – child-onset and adolescent-onset (DSM-IV-TR, 2000) – which have been theorized to have different associated causal factors (Ministry of Social Development, 2009). Child onset is more persistent and thought to result from a number of personal and environmental difficulties, whereas adolescent-onset has been linked to factors which lead to abnormally extreme teenage rebellion and is often limited to this specific developmental phase (Dandreaux & Frick, 2009). Thus, it is possible that, as with antisocial behavior in general, for most antisocial youth, firesetting is adolescent limited and that, if so, understanding their firesetting within this developmental framework may prove useful in addressing their behavior. Such a possibility should not be excluded from developmental theory until research suggests otherwise.

Based on the notion that there are distinct subtypes of pathological firesetters whose behavior differs in severity it is possible that the firesetting behavior of different subtypes is also likely to follow distinct developmental trajectories. While Del Bove's (2005) Home-instability-moderate (HM) cluster has the most severe environmental dysfunction, the Multi-risk Persistent (MP) cluster exhibits the most severe behavior, suggesting that environmental dysfunction is unlikely to be operating alone to produce firesetting behavior within the MP cluster. Del Bove (2005) suggests that for the MP cluster firesetting may result more from a temperamental predisposition, rather than the family stressors implicated in the HM cluster. This is theoretically consistent with developmental theory for conduct problems in general and the notion that CD in some individuals may develop as primarily a result of temperamental characteristics, particularly the presence of callous unemotional (CU) traits (Dadds, Whiting, & Hawes, 2006).

Such a relationship between CU traits and behavior was found in a study of children exhibiting cruelty to animals, suggesting the possibility of a similar role for CU traits in the development of other severe antisocial behaviors such as firesetting (Dadds et al., 2006). In antisocial youth, CU traits have been found to be associated with early onset, severe, aggressive and stable antisocial behavior as well as later delinquency (Dandreaux & Frick, 2009; Frick, Stickle, Dandreaux, Farrell, & Kimonis, 2005; Frick & White, 2008). Because some firesetting typologies are also closely linked to severe antisocial behavior, and also because firesetting has been shown to relate to cruelty to animals (Dadds et al., 2006), the role of CU traits in determining severe, pathological firesetting necessitates further investigation and has yet to be sufficiently addressed in the literature.

4.11. Summary of risk factors

Many factors have been found to correlate with firesetting behavior and to differentiate between firesetters and non-firesetters in environmental, individual and fire specific domains. Excluding those that are fire specific, most of these factors are also risk factors for child and adolescent psychopathology in general, making it unclear whether they are risk factors for firesetting specifically or for common comorbid pathology such as conduct problems.

Although research in the area is currently very limited, there are strong indications that firesetting is closely associated with severe antisocial behavior and that amongst antisocial youth, those who set fires are a particularly high-risk group. Further research investigating this relationship between firesetting and severity of antisocial behavior is necessary, with both firesetting and non-firesetting antisocial youth, in order to better understand why fire behavior emerges and how to best identify and assist at risk individuals. It is notable that an understanding of firesetting within the framework of antisociality is limited to antisocial or pathological firesetters.

While not all children and adolescents who deliberately light fires are otherwise behaviorally problematic, for many firesetters, particularly more pathological firesetters, firesetting is likely to be one of a number of maladaptive behaviors and to develop within a context of individual psychopathology and family dysfunction. Amongst more pathological firesetters, it is likely that there are multiple pathological subtypes whose behavior develops along different trajectories. For the majority of pathological firesetters family dysfunction and psychopathology are probably largely responsible for the development of firesetting, however for most severe pathological firesetters, the child's temperament may also play a role.

5. Treatment

Arguably the most understudied area of interest concerning firesetters is that of intervention. The two most prevalent intervention approaches for firesetting children and adolescents are fire service operated educational interventions, and mental health-based psychosocial interventions. While there is a literature intended to guide professionals working with firesetters (Kolko, 2002; Stadolnik, 2000), it is subject to the limitations of the research from which it draws its conclusions. Assessment tools are, at this stage, somewhat limited and in need of testing. While research supports multidimensional collaborative treatment approaches (Kolko, 2001), lack of long-term outcome studies means that evaluations of intervention efficacy are limited.

5.1. Assessment

Assessment of firesetting children and adolescents is essential in gaining an understanding of the nature of their behavior and selecting an appropriate treatment approach. There is a widespread agreement amongst clinicians and researchers working with firesetters as to the need for comprehensive assessment which considers the domains of fire history, individual functioning (cognitive, behavioral, social and emotional), and family functioning (Kolko, Wilcox, Nishi-Strattner, & Kopet, 2002; Stadolnik, 2000). The Oregon Cycles Model (Oregon Treatment Strategies Task Force, 1996) emphasizes the interactive contribution of community, family, behavioral and cognitive-emotional cycles in firesetting, and the importance of acknowledging the interactive effect of risk factors in the causation, reinforcement and maintenance of firesetting behavior (Kolko et al., 2002). Wilcox and Kolko (2002) emphasize the importance of considering, in assessment, the potentially self-reinforcing nature of firesetting in its function of relieving boredom, expressing anger, satisfying curiosity or because it involves peer group engagement.

Despite a clear need for the assessment of firesetters, there is far less consensus regarding specific assessment tools or approaches in gathering information and assessment approaches range from brief screening administered by fire service staff to extensive in-depth clinical assessments (Stadolnik, 2000). While some assessments specifically assess fire history and fire incident specific variables, other assessments have been developed to assess a wide range of firesetting correlates and thus have the potential to elucidate necessary targets for treatment. It is also critical that risk assessments consider other problem behaviors and risk for future offending, given the close relationship between firesetting and other antisocial behavior.

5.2. Educational interventions

In a recent review of firesetting interventions throughout England and Wales, Palmer, Caufield, and Hollin (2007) observed that fire and rescue service educational interventions were conducted by a firefighter and consisted of a one-off home visit, with follow-up contact and provision for further follow-up visits if necessary. Such

programs operate across North America, Canada, Australia and New Zealand. The rationale behind the use of educational interventions for firesetters is that in teaching fire knowledge and fire safety skills, correlates of firesetting such as high fire interest, fire curiosity (MacKay et al., 2006; Kolko et al., 2006), and low fire fear (Del Bove, 2005) will be minimized and alternative, positive, fire-safe behaviors encouraged. While educational interventions are best suited to low risk fire setters, they are also likely to be necessary, if not sufficient, for more severe firesetters. Due to the need to minimize access to fire-starting materials and to maximize parental supervision of firesetters, parents' presence in fire safety education is generally considered to be important; parental involvement in educational interventions has also been shown to significantly increase the implementation of fire safety into the home (Carroll, Augsen, Hansbrough, & Williams, 1986).

There is limited information regarding the efficacy of established educational programs largely due to an absence of post-intervention monitoring and a lack of program evaluations (Palmer et al., 2007). While educational interventions through fire services are relatively common, they vary hugely and lack coordination or standardization, reflecting the lack of available research and established practice to guide programs (Barreto, Boekamp, Armstrong, & Gillen, 2004; Palmer et al., 2007).

5.3. Mental health interventions

Because the psychopathology of severe firesetting youth is often in the clinical range, their needs go beyond the fire safety, skills and knowledge offered by fire education programs. Emphasis has increasingly been placed on the role of mental health-based psychosocial and behavioral interventions to address the extensive number of firesetting correlates such as family dysfunction and individual psychopathology which are typical of multi-problem youth. While educational interventions are widely available, and may involve referral to mental health services, there are far fewer mental health-based programs available which are specifically aimed at, age appropriate for, and able to target more serious firesetting behaviors in children and adolescents (Barreto et al., 2004; Palmer et al., 2007). Palmer et al. (2007) noted that such interventions in England and Wales were residential and catered only for older adolescents or adults. While mental health-based treatments are becoming more widespread, such as The Arson Prevention Program for Children in Toronto Canada (TAPP-C), which has shown high rates of adoption amongst mental health professionals who attended its workshops (Henderson, MacKay, & Peterson-Badali, 2006), these programs generally lack systematic evaluation.

Psychosocial interventions generally take a cognitive-behavioral approach to addressing problem behavior and its causes and tend to involve therapy techniques and approaches that are commonly employed by clinicians to address a wide range of child psychopathology. Due to the heterogeneous nature of the firesetting population and the need to target firesetting correlates and treatment needs specific to the individual of concern, treatments will vary widely (Stadolnik, 2000).

Within a predominantly cognitive-behavioral approach to treatment, methods such as parent training, problem-solving and assertion skills training, and community-based multisystemic treatments are employed, all of which are also used for disruptive behavior disorders (ODD, CD). Training firesetters and their families in problem-solving and assertion skills, identifying and challenging dysfunctional and distorted cognitions, and teaching appropriate anger expressiveness, anger control and affect identification (Kolko, 2002) are all techniques intended to decrease firesetting by addressing maladaptive patterns of thought, emotion and behavior and replacing them with more appropriate alternatives. In order to effectively address interactive factors which cause and maintain firesetting, it is important that the clinician, firesetter and their caregivers have an understanding of the

antecedents and consequences of behavior and the causal relationships between experience, thoughts, emotions and firesetting behaviors. Graphing (Bumpass, Fagelman, & Brix, 1983) is a method of visually displaying feelings along a timeline of external stressors and behavior and is intended to 'help the patient become aware of the cause-effect relationship between feelings and behavior'.

Because family dysfunction is a consistent correlate of severe firesetting behavior and has been shown to play a role in the wider antisocial behavior of more severe firesetting individuals, it is crucial that the family system is addressed as part of any intervention. Family therapy is an important means of providing parental support, training, guidance and education, and improving parent-child communication, discipline and family problem-solving skills (Kolko, 2002; Stadolnik, 2000). Treatment often incorporates parent training which teaches child management, monitoring, reinforcement and response-cost techniques (Kolko, 2002). Family therapy may also provide an opportunity to identify and address parental psychopathology, which may contribute to or maintain firesetting behaviors (Kolko, 2002). For firesetters who experience significant environmental and familial difficulties, such as Del Bove's (2005) Home-instability-moderate cluster or Fineman's 'Cry-for-help' subtype, family-focused intervention is likely to be the key to success, along with ongoing support and parent control and supervision. Affect regulation strategies and coping skills are also likely to be necessary in treating individuals whose behavior functions as a reaction to an environmental stressor.

The placement of firesetters in residential treatment facilities has been deemed necessary in very serious cases where community-based interventions are insufficient for treating behavior, when the living environment of the individual poses great risk to continued behavior or when the individual poses a significant risk of harm to himself or to others (Stadolnik, 2000). However, because environmental and family factors play an important role in behavior for many of these youth, it is essential that they continue to be addressed in the intervention, even though the individual has been temporarily removed from these family and community systems.

The firesetting literature has almost entirely ignored the issue of culture, and how different groups defined by variables such as ethnicity and socioeconomic or minority status may be more at risk for firesetting as is the case with many conduct problem behaviors. However, an awareness of how to best approach intervention for at risk cultural groups is likely to be crucial for the success of therapeutic interventions. Sue (1998) argues that cultural differences can impact upon assessment validity, rapport and treatment effectiveness and that assumptions and theories of treatment do not necessarily translate well from one culture to another. Consequently, therapist cultural competence and an understanding of the impact of cultural factors on the development and expression of behavior, as well on treatment is likely to be critical to positive treatment outcomes. Additionally Sue (1998) suggests that key aspects of cultural competence include taking a scientific rather than assumption-based approach to assessment, finding a balance between acknowledging cultural group characteristics that may influence individual behavior, and avoiding stereotyping individuals and having specific knowledge of one's own world views and of the cultural groups with which they work. It is likely that specific approaches such as therapist-client cultural matching will have a positive impact on therapeutic engagement and subsequent treatment outcomes (Sue, Fujino, Hu, Takeuchi, & Zane, 1991).

5.4. Integrative treatment

Because of the importance of fire education for all firesetters and the necessity of rigorous assessment and the provision of mental health services for those who require it, an integrated approach to treatment is preferable. Stadolnik (2000) suggests that best practice

interventions will specifically target firesetting behavior and problematic family or environmental factors, will improve deficits in individual functioning (social, emotional or academic) and will increase fire safety knowledge and skill. The Massachusetts Coalition Model (cited in [Stadolnik, 2000](#)) recommends a multidimensional treatment approach involving fire service, juvenile justice, law enforcement, mental health and social service professionals. It recommends that treatment is delivered by trained professionals, operates under clear guidelines, can provide ongoing care from a range of services and is subject to thorough evaluation ([Stadolnik, 2000](#)). Similar recommendations resulted from a review of existing literature and interventions in Rhode Island ([Barreto et al., 2004](#)).

[Stadolnik \(2000\)](#) noted that firesetters, as a heterogeneous population, seem best served by multidisciplinary, community-based, fire service-led intervention. Because many firesetters are first referred to the fire department, a collaborative approach means that, if required, the mental health needs of those individuals can be sufficiently met, as intervention is not limited to the fire specific expertise of fire service personnel. [Palmer et al. \(2007\)](#) observed that very close multi-agency contact, especially during assessment and referral, was a characteristic of best practice programs. Collaborative programs such as the JFAIP in New York City initially screen firesetting youth upon fire service contact to classify the 'concern' level of the firesetter, and referral to mental health for further assessment and treatment is made when it is deemed necessary ([Webb, Sakheim, Towns-Miranda, & Wagner, 1990](#)). Given that her Conventional-limited cluster did to some extent (although at a lower rate than the severe clusters) have previous mental health contact and learning difficulties, [Del Bove \(2005\)](#) suggests that mental health referral is likely to be necessary even for some non-severe firesetters and that thorough initial assessment is therefore necessary in order to determine this necessity.

A multi-agency approach also allows for the use of coercion where necessary for resistant families. It must be noted that while severely dysfunctional families have the greatest need for intervention, it is also these families who are most likely to resist such help and are least likely to cooperate when referred to mental health services ([Webb et al., 1990](#)). In a review of the JFAIP NYC, [Webb et al. \(1990\)](#) conclude that disruptive family environments, while likely to both contribute to and be exacerbated by firesetting, also may distract from and interfere with treatment, and that a coercive component and 'aggressive outreach' whereby fire marshals can make repeat home visits to explain that the mental health referral that has been agreed upon is required, contribute to the program's success. In an early review of the Juvenile Fire Offenders Program, a collaborative initiative in Colorado, it was noted that social service involvement was not only important in providing psychological interventions for severely problematic children but also in supporting fire service personnel in their ability to work with behaviorally problematic youth ([Nishi-Strattner, 2003](#)).

5.5. Efficacy of treatment

There is limited research concerning the efficacy of different programs and treatment approaches in the reduction of firesetting behavior, which aspects of multi-faceted treatments are most successful, or which intervention approaches may be best suited to which subtypes of firesetting individuals. A lack of systematic outcome evaluations of existing programs means that there is limited information to guide and improve future interventions. For this reason, the current review does not seek to critique existing intervention programs, but rather to discuss a number of studies have sought to compare or evaluate the efficacy of various treatment approaches. Refer to [Table 3](#) for summaries of the following treatment efficacy studies, including (where applicable) sample source, treatment groups, sample size, treatment descriptors, follow-up period, recidivism rates, outcome measures and findings.

Interestingly, [Adler, Nunn, Northam, Lebnan, and Ross \(1994\)](#) found that a multi-component treatment involving fire safety education, parental-directed behavior modification through satiation, parental negative consequence responses to firesetting and graphing did not result in lower levels of firesetting frequency or severity within the 12 month period following intervention, than simply being provided with a fire safety education pamphlet. However, it is arguable that this is likely to be due to the fact that while the intervention had both educational and cognitive-behavioral components, it was administered solely by a firefighter and utilized neither a multi-agency approach nor appropriate professionals—characteristics of 'best practice' intervention described by authors such as [Stadolnik \(2000\)](#). In addition to this the use of satiation methods whereby a firesetter repeatedly lights fires in an attempt to decrease their fire interest and firesetting behavior is controversial, rarely seen in recent practice and should be avoided given the positive alternatives ([Kolko, 2002](#)). Additionally, this study found that the inclusion of specialist psychiatric and psychological referrals (and resulting assessment and treatment where required) did not result in less firesetting frequency or severity at follow-up. However this finding is likely to have been affected by the study design which placed only those firesetters categorized as 'pathological', and therefore more likely to be at risk for recidivism, in the specialist referral treatment conditions.

[Kolko \(2001\)](#) compared an eight-week, psychologist-administered CBT program designed to specifically address clinical factors associated with firesetting (involving graphing, problem-solving, assertion and interpersonal conflict resolution training, parent education and behavior training as well as the development of a home-based contingency) with an eight-week fire safety education program (FSE) and a two-contact firefighter home visit (HVF). The study found that while all treatment conditions resulted in a significant reduction in firesetting, subjects in the CBT and FSE groups exhibited significantly less firesetting, matchplay and fire interest at 2 year follow-up (24% and 15% respectively) than those in the HVF group (50%). The CBT condition resulted in the greatest reduction in fire-related acts and fire attraction. At both post-treatment and one-year follow-up, the CBT group showed a significant decrease in deviant fire behaviors (inappropriate interest in fire, deviant fire activities such as hiding fire materials, and negative peer influences), while the HVF group showed a significant increase.

Another study, which assessed the efficacy of CBT, FSE and a two-contact firefighter home visit FHV condition in improving intervention-specific targets ([Kolko et al., 2006](#)), found that fire safety education, unsurprisingly, resulted in the greatest improvement in fire safety skills and knowledge. CBT resulted in greater improvement than the two educational interventions on measures of problem-solving skills but not in other child behaviors and parenting practices which it targeted. For firesetters from more dysfunctional families, intervention condition was strongly related to recidivism rates at 1 year follow-up, with FSE and CBT found to be more effective than FHV and, amongst firesetters with increased exposure to fire models and materials and fire safety knowledge, FSE was found to be more effective than FHV.

At a six-month follow-up, fire safety skills training has been shown to result in a greater reduction in preference for, or contact with, fire-related stimuli, less overall involvement with fire and reduced firesetting when compared to a discussion and assessment of firesetting behavior ([Kolko, Watson, & Faust, 1991](#)). Similarly, in a comparison of CBT with education and fire skills training, it was the education and fire safety skills that had a greater effect on the reduction of fire interest ([Kolko, 2001](#)). Although further research is needed, these findings would seem to indicate that the increased fire knowledge and reduction in fire interest that result from educational interventions play an important role in reducing firesetting behavior and that, for these reasons, educational interventions, although not sufficient for firesetting youth with wider psychopathology, are likely to be an important factor in any successful treatment program for both non-severe and severe firesetters.

Table 3
Treatment studies.

Study	Country	Sample N	Treatment groups	Group N	Treatment description	Follow-up period	Recidivism rates	Outcome measures	Finding
Adler et al. (1994)	Australia	138	(1) Home-experimental	22	Firefighter-administered intervention. Education, behavior modification, negative consequences, graphing.	3, 6, 9 and 12 months	19%	Rates and severity of firesetting.	Significant reduction in firesetting rates and severity across all treatment conditions. No significant differences between treatment conditions in recidivism rates, severity or improvement.
			(2) Home-control	19	Educational pamphlet.				
			(3) Specialist-experimental	49	Same as (1) + specialist referral				
			(4) Specialist-control	48	Same as (2) + specialist referral				
Bumpass et al. (1983)	USA	26	Graphing, no control	26	Graphing	6 months–8 years. Mean 2.5 years	6.9%	Report of firesetting at follow-up.	2 of 29 reported firesetting at follow-up.
Bumpass, Brix, and Preston (1985)	USA	150	Graphing	150	Delivered by fire department personnel trained by psychiatrists. Emphasis on destructiveness of firesetting. Graphing interview with emphasis on correlation between feelings and behavior. Discussion of alternative, socially acceptable behaviors. Weekly sessions until firesetting ceases and 3 additional informal meetings (to aid child involvement with other community support systems). Additional contacts if required. 1-year follow-up visit.	Unknown	2%	Firesetting recidivism rates and official fire service records (prevalence and cost).	There was a 30% decrease in firesetting recidivism in the year following implementation of the program. Of the 3 who did set subsequent fires, 2 did so before program completion and did not after. There was a 31.4% decrease in the number of, and a 48% decrease in the cost of, fires set by children or adolescents over a 6-month period subsequent to the program starting compared with a 6-month period prior.
Franklin et al. (2002)	USA	234	Trauma Burn Outreach Prevention Program (TBOPP)	132	1-day. Focus on impact of firesetting behavior and accountability. Parent/guardian attendance required. Involves nurse educators, trauma surgeons, social workers, firefighters, burn victims and former program graduates. Interactive education in trauma burn intensive care unit, skin bank, morgue, and injury prevention centre. Fire safety equipment provided.	8 months–2.5 years	0.8%	Fire department and court follow-up records of firesetting and family report of firesetting at follow-up.	After adjusting for age, sex, medical/behavior history, type of original offence, and family home environment the no TBOPP were significantly more likely to set fires during follow-up. Those from foster parent homes were significantly more at risk for future fire reoffence than those from two parent homes. The average satisfaction score (of participants and their families) was 4.9 out of 5 representing 'extremely satisfied'.
			(2) no TBOPP (random control)	102	Did not attend the TBOPP program but satisfied entry criteria.		36%		
Kolko (2001)	USA	54	(1) CBT (Cognitive-Behavioral Treatment)	21	8 × 1 hour weekly sessions. Graphing, training in problem-solving skills, self-instruction, assertion and interpersonal conflict resolution skills. Parent psychoeducation and behavior management training. A home-based contingency developed.	13 weeks, 1 year	24% CBT	Frequency of firesetting and matchplay behavior, individualized child problems with fire, fire-related activities, fire interest/attraction, court and social service records of juvenile court involvement for arson or related crime.	Significant reductions in firesetting in all conditions (at 1 year follow-up). Significant reductions in matchplay and fire interest in only CBT and FSE conditions. Significantly fewer CBT and FSE children (than HVF) children reported either behavior. Significant reduction in fire-related acts—greatest reduction for CBT. CBT showed a significant decrease in deviant fire behavior at post-treatment and follow-up whereas HVF showed a significant increase. Significant reduction over time for fire attraction showing greatest improvement for CBT followed by FSE.
			(2) FSE (Fire Safety Education)	17	8 × 1 hour weekly session. Firefighter educator, parents involved.		15% FSE		
			(3) HVF (Home visit by firefighter)	16	Two contact condition (second contact takes place 8 weeks after the first). Information, fire safety materials (e.g. coloring book). 'No-fire' contract, parents invited to be included and given home fire safety handout. 2nd contact: review and elaborate.		50% FHV		

Table 3 (continued)

Study	Country	Sample N	Treatment groups	Group N	Treatment description	Follow-up period	Recidivism rates	Outcome measures	Finding
Kolko et al. (2006)	USA	46	(1) (CBT) Cognitive-Behavioral Treatment	21	8 × 1 hour weekly sessions. Graphing, training in problem-solving skills, self-instruction, assertion and interpersonal conflict resolution skills. Parent psychoeducation and behavior management training. A home-based contingency developed.	13 weeks, 3 months, 1 year.	–	Presence of firesetting (reported by either parent of child), presence of matchplay (reported by either parent or child).	FSE showed greater improvement in fire safety skills and knowledge. CBT associated with greater improvement in problem-solving skills. FSE was not more effective in reducing curiosity about or attraction to fire. FSE more effective than FHV amongst children with heightened fire safety knowledge and exposure to fire models/materials. FHV less effective than FSE or CBT amongst families with heightened general dysfunction.
			(2) FSE (Fire Safety Education)	17	8 × 1 hour weekly session. Firefighter educator, parents involved.				
			(3) FHV (Firefighter Home Visit)	16	Firefighter administered. Two contact condition (second contact takes place 8 weeks after the first). Information, fire safety materials (e.g. coloring book). 'No-fire' contract, parents invited to be included and given home fire safety handout. 2nd contact: review and elaborate.				
Kolko et al. (1991)	USA	24	(1) Fire Safety/Prevention skills training (FSST)	12	Four, weekly 1-hour sessions, small group, common fire safety concepts/strategies and promote retention/application of these	6 months	16.6% FSST	Observation of toy play (fire- and non fire-related stimuli), picture preference, fire safety/prevention knowledge, and parent reported fire involvement (matchplay or firesetting).	FSST showed greater overall improvement over time than FAA but no significant group differences in fire interest or involvement. Significantly fewer FSST than FAA children engaged in either matchplay or firesetting at follow-up. FSST showed a significant reduction in fire stimuli preference scores and greater improvement in fire safety knowledge. FSST children (but not FAA) showed significant reductions in interest in fire, matchplay and firesetting at follow-up.
			(2) Fire Assessment/Awareness (FAA)	12	Review of prior fire contact and coloring book and assessed by staff.		58.3% FAA		
Nishi-Strattner (2003)	USA	219	Washington County Fire Academy Program. No control.	219	Parent training (addresses supervision, involvement and disciplinary techniques) and child education (age appropriate, fire safety, firesetting consequences, and social skills).	3 months–3 years	6.2%	–	–

Kolko's (2001) finding that eight-session, firefighter-delivered education and skills training resulted in a more significant and ongoing reduction in fire interest and other fire-related measures than the two-session home visit is noteworthy. It may indicate the potential for educational interventions administered by firefighters to have more far-reaching effects through a more extended and extensive focus with emphasis on skills as well as education.

Interestingly, short but intensive programs have also been found to be successful, such as a one-day interactive educational program based in a trauma burn centre, which focused on the impact of firesetting behavior and involved burn centre staff, burn victims, social workers, firefighters and program graduates (Franklin et al., 2002). Those who attended the program had only a 0.8% firesetting recidivism rate based on parent report as well as fire department and court records over an 8 month–2.5 year follow-up period. This recidivism rate was significantly lower than that of the control group (36%) who met entry criteria for the program but did not receive treatment.

5.6. Summary of interventions

While many firesetting interventions are available, they are mostly educational in nature and cater largely for firesetters whose problem behavior is confined to firesetting, and often to a single referral incident. However, for firesetters who exhibit multiple problem behaviors and other mental health, learning and family problems, and for whom firesetting for these individuals may indicate that they are particularly at risk for severe antisocial behavior and future offending, a more comprehensive approach to treatment is needed. This does not necessarily require specific mental health programs targeting firesetting, but rather the development of close relationships between fireservice operated educational programs and mental health services knowledgeable in the area of firesetting.

Comprehensive assessment is necessary upon presentation with the fireservice to determine the necessity for referral and subsequent mental health intervention. There are free and reliable assessments available which fireservice programs can easily access, the result of

which can be shared with mental health professionals where appropriate. An example of one such assessment is the 'Strengths and Difficulties Questionnaire' (SDQ). The SDQ is a brief 25-item behavioral screening questionnaire that is available in multiple languages and assesses 5 scales—emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behavior. There are various age relevant versions of the assessment which is suitable for 3–16 year olds and can be completed by parents or teachers, and includes self-report versions appropriate for 11–16 year olds, dependent on literacy and level of understanding. The SDQ has been found to have good reliability and validity (Goodman, 2001; Hawes & Dadds, 2004) and to be useful (when administered to multiple informants) for screening for conduct, hyperactivity and depressive disorders in a community sample (Goodman, Ford, Simmons, Gatward, & Meltzer, 2000). It has also been found to be as effective as the Child Behavior Checklist (CBCL) in detecting problems on all scales and distinguishing between high and low risk populations (Goodman & Scott, 1999).

Although research is limited, the need for multisystemic, multidimensional and comprehensive treatment approaches is reinforced by indications that different treatment approaches may target different aspects of fire-related behaviors, and may differ in efficacy depending upon individual, environmental and family differences. Rigorous and ongoing evaluation of existing intervention programs will assist in the establishment of a body of literature to guide intervention efforts.

6. Methodological limitations

6.1. Samples

While more recently a small number of community sample studies have been conducted (Becker et al., 2004; Dadds & Fraser, 2006; Del Bove et al., 2008; Martin et al., 2004), the majority of the samples in firesetting research consists of incarcerated individuals or those undergoing mental health care. Consequently, the majority of the samples is likely to represent severe firesetters and may not generalize to less severe typologies. Because there have been significant differences found between mental health care patient and non-patient samples (in both rates of firesetting and predictors of recidivism) (Kolko et al., 2001; Kolko & Kazdin, 1991b), a study of one of these groups is unlikely to be able to be generalized to other populations. With most studies drawing their samples from identified firesetters, unidentified firesetters are underrepresented in the research and only included when they have been identified through community samples and prospective studies.

Because firesetting is significantly more prevalent in males than females, samples tend to be all, or largely male. Although research using male samples and thus providing information about male firesetters is very useful, it can certainly not be assumed that these findings will generalize to female firesetters, who are often included in research in such a small number that studies lack sufficient power to detect gender differences. Research has yet to determine whether female firesetters constitute a distinct group of firesetters; however, indications that their associated psychopathology and needs for treatment may differ (Dadds & Fraser, 2006; Rappaport & Thomas, 2004) emphasize the importance of understanding such differences.

Studies tend to use samples of children, adolescents, or both. However, due to the lack of comparative studies exploring the extent to which these firesetting groups are similar or different, it remains unknown whether the findings from one age group can be generalized to the other.

There is inconsistency between typological theory, which places emphasis on the heterogeneity of firesetters, and empirical studies, which tend to approach firesetters as a single group or separate them simply in terms of 'severe' and 'non-severe'. Consequently, the fact that firesetters are a heterogeneous group, and have, more recently,

been empirically subtyped, poses issues for the validity of the existing body of research. It is possible that results of studies which compare firesetters to non-firesetters may be prone to considerable variation dependent on the relative numbers of severe and non-severe firesetters in the sample, and similarly, those that compare severe and non-severe firesetters would be prone to variation dependent on relative levels of different severe subtypes (such as HM and MP firesetters). This possibly explains the lack of consistency in risk factor and recidivism studies.

6.2. Constructs and measures

Within existing research there is inconsistency in definitions of constructs as well as in the measures used. Definitions of firesetting range from 'falling within the top 5% for age and gender' (Dadds & Fraser, 2006), to a single positive response to the item 'I have set fire to things in public places just for fun' (Martin et al., 2004). Community sample research regarding firesetters often extracts data from larger, more general surveys (Martin et al., 2004) and, consequently, firesetting behavior is measured by a single question that is open to misinterpretation by the participant and provides little information concerning the nature of their firesetting.

Studies vary in their use of parent or child report to measure behaviors. Discrepancies between the two have been found, particularly in that children tend to report higher rates of their antisocial behavior (Kolko & Kazdin, 1994). This suggests an inaccuracy in parent reports, which authors have suggested is likely to be a result of parents being unaware of their children's covert behaviors (Del Bove et al., 2008). It is therefore preferable to base studies on a wide range of data sources including from parent, child, psychological and school reports.

6.3. Development and causality

Due to a lack of prospective studies, and because risk factor studies tend to examine variables and firesetting status or severity concurrently, (Kolko & Kazdin, 1990), such research is unable to establish causality and direction of influence. For example, parental stress (Dadds & Fraser, 2006) may be an environmental factor which contributes to firesetting, or a factor that is elicited or exacerbated by firesetting. It is likely that risk factors for firesetting will change over time, probably dependent on an individual's development, age and firesetting typology, however due to the lack of longitudinal studies, such conclusions remain very tentative.

6.4. Limitations in intervention and recidivism studies

Intervention studies often lack true control groups largely due to the ethical issues of offering no treatment to one group. Unsurprisingly, Kolko et al. (1991) reported significant parent reluctance to participate as part of a control group where no treatment was offered to their child. Consequently, the conclusions that can be drawn from these studies are limited.

As most efficacy studies look purely at the outcomes of one intervention or one intervention versus another, little empirical information is available regarding which subtypes of firesetters may benefit from which type of intervention. It is plausible that certain interventions would show significantly more efficacy when applied to only certain subtypes of firesetters. However for such research to be undertaken it is necessary to first further clarify the validity of existing firesetting types.

Intervention and recidivism studies which measure firesetting and related behaviors over a follow-up period typically fail to investigate factors during this period, which may influence behavioral outcomes. Whether participants received treatment or services during the follow-up period is particularly likely to influence outcome and in

studies where this is not stated it is difficult to accurately interpret findings.

7. Clinical implications and directions for future research

There is a need for firesetting research that assesses a wide range of different variables, draws on large and diverse samples, utilizes appropriate comparison groups and conducts yearly follow-up assessments over an extended period of time.

In order to better establish clear prevalence rates of firesetting as well as to identify characteristics of firesetters from normative rather than clinical samples, there is a need for more large-scale community studies. The major limitation of community studies is that they tend to be based on large general surveys and contain only one firesetting item, thus giving limited information concerning the nature and severity of fire behavior. Consequently, community studies which measure a number of fire specific items would best contribute to understandings of these populations.

Given the dominance of typological theory and lack of empirical investigation into firesetting typologies, there is a need for thorough investigation in this area.

The developmental characteristics of firesetting behavior are still largely under researched, and there is a clear gap in the firesetting literature concerning the mechanisms involved in the relationship between firesetting behaviors, antisociality and future offending. While it appears firesetting is best understood within the framework of antisociality it remains unknown why it is associated with severity of behavior, and what predisposes an antisocial individual towards firesetting specifically. A small number of research efforts indicate that antisocial firesetters are likely to be at risk for a range of problem behavior and future offending regardless of whether it is of the arson type. Further investigation of this population is therefore critical, as subsequent studies are likely to inform efforts to maximize effective interventions, minimize risk, and develop and test theory surrounding this issue.

Future studies should investigate how the motivational, mental health, demographic and behavioral characteristics of firesetters relate to firesetting behavior, other antisocial behavior and future offending, and should investigate risk correlates and predictors of firesetting amongst antisocial individuals both before and after controlling for antisocial behavior. Firesetting populations such as groups of firesetters referred to fireservice based educational programs may be utilized to investigate the differences between antisocial and non-antisocial firesetters particularly in areas such as motivation, nature of fire setting behavior. Samples that include antisocial non-firesetters, non-antisocial firesetters, and antisocial firesetters would allow for further investigation into factors which might differentiate antisocial individuals who fireset, from those who do not. Prospective studies would allow for more definitive identification of risk factors for firesetting recidivism and, if conducted over a long time period would assist in an understanding of the developmental trajectories of antisocial and firesetting behaviors. Longitudinal work which examines offending outcomes, including retrospective studies which look at offending behaviors of samples including firesetters and antisocial non-firesetters would be particularly informative.

It is crucial that researchers and those who are actively involved with firesetters in education and intervention, are aware of this relationship between firesetting and severe antisocial behavior, and that the presence of firesetting in those who exhibit other disruptive behaviors, is likely to indicate risk for future offending, as indicated by a number of small research efforts.

A multi-agency, collaborative approach whereby the maximum number of services and organizations are drawn upon, is likely to provide the most comprehensive assistance for all firesetters and their families. It is therefore important that educational interventions

maintain and build upon relationships with other organizations – including law enforcement, justice, social service, mental health organizations and schools – to develop a collaborative multi-agency approach to intervention, with a comprehensive system of referral which ensures early and wide ranging provision of intervention approaches to best minimize risk for both firesetting behavior and future offending. It is important that at-risk firesetters are correctly identified and referred on to the appropriate services in order to address factors contributing to their behaviors and thus minimizing risk for future offending. Given that fire service operated educational interventions are the predominant treatment approach for firesetters, it is necessary that assessment tools that can be administered by a practitioner with no clinical training be incorporated into the intervention process to ensure provision of appropriate and accurate referral when it is required for at-risk firesetters. There is therefore a need for studies which seek to develop assessment measures specifically tailored to fireservice interventions and which assess firesetting and more general risk. Such assessments would help to ensure that referrals from fire services are consistent and accurate and that potential practitioner bias or error is minimized. Additionally, programs and practitioners who work with conduct and disruptive behaviors should incorporate firesetting items into risk assessments as the presence of firesetting indicates risk for particularly severe behavior amongst these individuals. When assessing and providing treatment to children who deliberately light fires it is important as part of a comprehensive treatment program to carry out a thorough functional analysis of their firesetting behavior. Functional analysis in behavior employs principles from behavior analysis to determine how behavior of individuals relates to their environment. According to the laws of operant conditioning, practitioners working with children who set fires need to determine the relationships between stimuli (fire) and responses of the child. To establish the function of a behavior, one typically assesses the “three-term contingency”: identifying the antecedent or trigger of the behavior, identifying the behavior itself and finally, identifying the consequence of the behavior which continues to maintain it.

One of the potential concerning issues that clinicians face when working with children who deliberately light fires is that interventions aimed to reduce firesetting, might actually cause both an increase in interest in deliberate firesetting as well as an increase in firesetting incidents. This is particularly the case in some special populations such as children with learning disabilities, pathological firesetters and children with impulse control problems. Such populations are potentially more likely to be vulnerable to suggestibility and less likely to be responsive to the negative consequences of firesetting for themselves and also the communities, as well as being more likely to be reinforced by the immediate rewards and of firesetting. Barlow (2010) argues that to prevent potentially negative consequences of therapy, it is necessary that research takes more of an individual idiographic approaches and endeavors to contribute to better understanding of for whom and under what circumstances therapeutic interventions may be detrimental. Future evaluations of firesetting interventions should therefore aim to assess the efficacy of a program not solely in terms of its firesetting recidivism rate but also in terms of the extent to which it addresses different correlates of firesetting behavior, and its relative efficacy for different groups of firesetting individuals. Additionally, thorough and ongoing evaluations of existing programs are necessary in order to inform and facilitate intervention development and maximize program efficacy.

8. Conclusion

From the current review of theory and literature, the following conclusions have been reached.

While there is a wide acknowledgement that firesetters are a diverse group of individuals and that there exist subtypes within this group, there

is considerable uncertainty as to what these subtypes may be. Typological theories have historically failed to sufficiently account for the complexities of firesetting behavior and are subject to flaws that limit their utility in clinical or research efforts. Del Bove's (2005) typology, although in need of replication, provides the most comprehensive and multidimensional typology to date. There is a need for empirical typological studies which build on the existing literature and aim to clarify firesetting types, and to develop assessments for accurate and consistent categorization of firesetting individuals.

Non-pathological firesetters show the least frequency and versatility of firesetting and are likely to exhibit few other comorbid disorders, antisocial behaviors, psychopathology or family dysfunction. Due to the fact that the majority of risk factors that emerge from the literature are also associated with antisocial behavior in general, and given the absence of studies looking at less pathological firesetters as a subgroup, risk factors for these firesetters remain largely unidentified. It is important to note however that this group (despite often being referred to as 'non-pathological') is unlikely to be entirely without psychopathology and it is therefore important that even firesetters who exhibit the least severe behavior, and most stable environment are screened for risk and pathology and receive mental health assistance where necessary.

For those whose behavior is more severe, firesetting is unlikely to exist in isolation and is best understood within the framework of antisocial behavior. Those firesetters who also exhibit comorbid behavioral problems are likely to be particularly severe in terms of antisocial behavior as well as risk for future offending. They are likely to come from particularly troubled backgrounds and to experience difficulties in multiple life domains. These firesetters are a particularly high-risk population and upon presentation to fireservice, mental health or justice agencies, it is crucial that they are given a comprehensive assessment and intervention tailored according to their risk, needs and responsiveness (Andrews & Bonta, 2010). In the most severe of firesetters, temperamental traits may also play a role in the emergence and persistence of firesetting. There is a need for further investigation into the relationship between firesetting and antisocial behavior to address the questions of why firesetting is associated with particularly severe antisociality, and what places an antisocial individual at risk for firesetting behavior specifically.

Thorough assessment and a multi-agency collaborative approach to treatment that addresses both fire education and psychosocial needs are important to ensure all the correlates of firesetting specific to any given individual are addressed. Assessment should address not just risk for future firesetting but also risk for antisocial behavior and future offending. It is essential that the high-risk nature of antisocial firesetters be acknowledged, and that comprehensive assessment identifies such individuals so that appropriate treatment is made available. Programs and professionals who deal with children and adolescents with behavior problems need to be alerted to the role of firesetting and its particular importance as an indicator of particularly high risk in such individuals.

An attempt to synthesize the literature reveals discrepancies between various firesetting theory as well as empirical findings that reflect the complex nature of firesetting behavior, and the diversity within firesetting populations. Consequently, the development of consistent and reliable assessment and intervention, supported by accurate epidemiological and typological theory, is a complex task. Subtle differences in firesetting populations may exist across countries and cultures and even within specific populations there are potentially differences between age and gender groupings. However, there is a need for a universal approach to the area of firesetting which it acknowledges its breadth, complexity and severity.

Acknowledgements

We would like to thank the New Zealand Fire Service and the Fire Service Commission for their ongoing support of research on

deliberately lit fires in New Zealand. In particular we would like to thank Ray Coleman, Peter Wilding and Dr Paula Beever, along with all the practitioners from the Fire Awareness Intervention Programme at the New Zealand Fire Service.

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